Freeform Search

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Term:

Display: 10 **Documents in Display Format:** - **Starting with Number** 1

Generate: ○ **Hit List** ◉ **Hit Count** ○ **Side by Side** ○ **Image**

Search Clear Interrupt

Search History

DATE: Saturday, August 19, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR		
L28	L26 and marks	30	L28
L27	L26 and sens$ same marks	0	L27
L26	L25 and pen	63	L26
L25	L24 and (bill or payment or invoice)	523	L25
L24	encoded with ("hpertext markup language" or "html")	1743	L24
L23	L21 and encoded with ("hpertext markup language" or "html")	0	L23
L22	L21 and coded with ("hpertext markup language" or "html")	0	L22
L21	L19 and (bill or payment or invoice)	46	L21
L20	L19 and bill	37	L20
L19	(point and multicast) not @py>1998	797	L19
L18	705.clas.	44009	L18
L17	705/39	1955	L17
L16	705/34	778	L16
L15	705/33	127	L15
L14	705/23	509	L14
L13	705/21	547	L13

L12	705/79	228	L12
L11	705/77	199	L11
L10	705/73	77	L10
L9	705/72	190	L9
L8	705/70	101	L8
L7	705/67	578	L7
L6	705/75	562	L6
L5	705/62	213	L5
L4	705/58	357	L4
L3	705/56	266	L3
L2	705/53	409	L2
L1	705/40	1631	L1

END OF SEARCH HISTORY

L21: Entry 4 of 46 File: USPT Aug 4, 1998

US-PAT-NO: 5790546
DOCUMENT-IDENTIFIER: US 5790546 A

TITLE: Method of transmitting data packets in a packet switched communications network

DATE-ISSUED: August 4, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Dobbins; Kurt	Bedford	NH		
Andlauer; Phil	Londonderry	NH		
Oliver; Chris	Rochester	NH		
Parker; Tom	Merrimack	NH		
Grimes; Andy	Cape Neddick	ME		
Nutbrown; Bruce	Campton	NH		
Hullette; Dan	Wilton	NH		
Dev; Roger	Durham	NH		
Jeffords; Jason	Dover	NH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Cabletron Systems, Inc.	Rochester	NH			02

APPL-NO: 08/567008 [PALM]
DATE FILED: December 4, 1995

PARENT-CASE:
This application is a continuation of application Ser. No. 08/188,238, filed Jan. 28, 1994, entitled NETWORK HAVING SECURE FAST PACKET SWITCHING AND GUARANTEED QUALITY OF SERVICE, and now U.S. Pat. No. 5,485,455.

INT-CL-ISSUED: [06] H04 L 12/56

US-CL-ISSUED: 370/400; 370/392
US-CL-CURRENT: 370/400; 370/392

FIELD-OF-CLASSIFICATION-SEARCH: 370/389, 370/392, 370/395, 370/396, 370/397, 370/400, 370/409, 370/410, 370/351, 370/388, 379/220
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL | Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4894822	January 1990	Buhrke et al.	370/60
☐	4987536	January 1991	Humblet	395/200.71
☐	4991171	February 1991	Teraslinna et al.	370/388
☐	5001707	March 1991	Kositoaiboon et al.	370/440
☐	5113499	May 1992	Ankney et al.	370/94.1
☐	5136580	August 1992	Videlock et al.	370/94.1
☐	5161192	November 1992	Carter et al.	380/48
☐	5226120	July 1993	Brown et al.	395/200
☐	5261044	November 1993	Dev et al.	395/159
☐	5274631	December 1993	Bhardwai	370/60
☐	5301303	April 1994	Abraham et al.	395/500
☐	5317566	May 1994	Joshi	370/400
☐	5357508	October 1994	Le Boudec et al.	370/409
☐	5432777	July 1995	Le Boudec et al.	370/397

OTHER PUBLICATIONS

Coral Broadband Enterprise Switch, Product Literature, Coral Network Corporation, Marlborough, MA (1994).

ART-UNIT: 272

PRIMARY-EXAMINER: Kizou; Hassan

ATTY-AGENT-FIRM: Wolf, Greenfield & Sacks, P.C.

ABSTRACT:

Apparatus and method for establishing "virtual connections" through a packet switched data communications network, the network including a plurality of end systems and switches connected by links. Each end system has a unique physical layer address and each switch has a connection database of valid connections between different ports on the switch and a switching mechanism for establishing temporary connections. Each switch is registered with a connection server such that, prior to transmission of a connectionless datagram from a first end system to a second end system, a path of valid connections through one or more switches from the first end system to the second end system is determined by configuring the connection table of each switch on the path with a connection identifier identified by the physical layer addresses of the first and second end systems, and wherein the data packet remains as a connectionless datagram. In other aspects, an improved method is providing for allocating bandwidth among competing devices requesting access to a bandwidth limited shared resource (e.g., the previously defined switch), and to a search method for making a best path determination through the network based on a number of constraints.

11 Claims, 29 Drawing figures

Previous Doc Next Doc Go to Doc#

L21: Entry 4 of 46 File: USPT Aug 4, 1998

DOCUMENT-IDENTIFIER: US 5790546 A
TITLE: Method of transmitting data packets in a packet switched communications network

Brief Summary Text (28):
ability to account for network use (why is the phone bill so high?)

Brief Summary Text (35):
Network infrastructures are built up around a core switching fabric. The switching fabric provides the physical paths or routes that allow users to send information to each other. Access to the switching fabric is gained through an access port. Access ports provide several functions--most importantly, they provide security and accounting services. Access ports also provide the network operator with the ability to monitor and control the access into and use of the switching fabric. End point systems such as personal computers (PCs), workstations, and servers connect to the access port using one of many access technologies such as Ethernet, Token Ring, FDDI, or ATM.

Brief Summary Text (36):
In a SFPS network, the access port acts as a management agent that performs five functions for the end point system. First, it provides directory services. Second it provides network access security services. Third, it provides routing services. Fourth, it provides the ability to reserve bandwidth along a path in the switching fabric. Finally, it provides accounting services. These five services: directory, security, routing, bandwidth management and accounting are required to provide a reliable network infrastructure.

Detailed Description Text (44):
*Important point: Since SFPS has to be transparent in the M11-M99 interaction, it cannot modify the packets being exchanged. Typically, in traditional switches, the switch sets a connection-identifier that gets put in each packet, and is remapped at each switch, to allow the packet to be switched along the path. Since SFPS cannot touch any packet content, it has to have something in the existing packet that it can use in each switch to treat as a unique connection-identifier while preserving the M11 to M99 packet exchange. What is unique about SFPS is that it treats:

Detailed Description Text (84):
To this end, it is expected that data link sub-systems will translate incoming frames from native to the canonical format, and perform the converse operation for frames to be transmitted. In the later-described embodiment entitled "Networking Chassis With SFPS Modules", a networking chassis having a common bus receives removable modules; if all external interfaces on a particular module are similar, the module may choose to translate (from native to canonical) before transmission out onto the common chassis bus. The point of translation within any module is a realization issue.

Detailed Description Text (93):
As previously discussed, one or more of networking modules 32 in chassis 30 may be an ATM cell switching module. Such a module would need to perform packet to ATM

cell conversion (and vice versa) for transmissions between the module and the chassis backplane. Within the ATM module, ATM cell switches function much like a router in that each switch receives cells from each port and then forwards them out the correct port (Unicast) or ports (Multicast). As the cell is forwarded to a switch, its header is modified with "next switch" routing information. This process continues at each cell switch until the cell is received at the end node. End nodes then strip away the cells and deliver the data to the end user or router application. Cell switches include a management agent (CPU) that is used to set up the logical connection through the switch as well as monitor the operation and performance of the switch and its ports or links. All cell switches are built around the core switch fabric which determines its maximum performance or switching capacity. Usually, this is expressed in Giga-bits-per-second (Gbps). ATM switching capacity in the one to two Gbps range are now becoming available, and switching capacities in the 20-40 Gbps range are expected within the next few years.

Detailed Description Text (114):
FIG. 8 is a schematic illustration of a distributed SFPS switch. A network 70 is shown schematically as a "cloud" to which there is connected by data path 71 a representative end point system 72. Data paths 73, 74, 75 connect the network 70 to an SFPS switch engine 76, call processor 77, and SCS (switch agent) 78. This is just one of many ways in which the functions of the switch may be distributed; there are many other ways. For example, the call processor may be part of a stand-alone server, part of the SCS, part of the SFPS switch, or part of the end point system. Similarly, the SCS may be physically a part of some other network component. The following is a more detailed description of the operations of the distributed switch according to the present embodiment.

Detailed Description Text (124):
8.2.1 The Switch MIB: Despite the fact that the Switch MIB provides a distributed view of the MIB, it does not provide a single logical view of the switching system across all of the chassis modules. This may not be apparent at first, but the Switch MIB provides for a distributed collection of switch engines that can be accessed from a single MIB view (see FIG. 10 showing SCS 78 connected to three separate switch engines on the left as the "physical switching system" 110, and connected on the right to a single "logical switching system" 111). The implications are that the SCS control agent must be able to manage and program each of the individual switch engines. For example, to obtain a connection path that had its ingress port on one module and its egress port on a different module, the SCS controller would have to program the ingress module with a separate connection going over the chassis backplane to the module with the egress port on it; the egress module would then have a connection going from the chassis backplane port to the egress port. However, this programming of each of the switches can be done through a single switch MIB and agent access point (the chassis IP/MAC address).

Detailed Description Text (130):
The search method can be described as a concurrent breadth first path search through a mesh of nodes and arcs--see for example the network topology or mesh of FIG. 1 wherein the switch S and end point systems M would be nodes, and the links L between nodes would be arcs.

Detailed Description Text (131):
The problem to be solved is to find a path between any two points in the mesh which has the following properties. The path is optimal for one metric and passes a set of threshold tests for n other metrics. Mathematically the desired path Q.sub.i of all the paths Q.sub.o, . . . , Q.sub.z is the one whose value v is the best and whose values a, . . . , n all pass threshold tests A, . . . , N. Secondarily, it must do this within a minimum time constraint T.

Detailed Description Text (152):
Global Adjacency [N]. A one-dimensional array (i.e. a vector) of lists. Each list

represents the adjacencies of the corresponding node. Each adjacency is a tuple of the neighboring node and the arc between them. A node may appear in multiple adjacencies for the same neighbor but must have a different arc index for each appearance. Each arc index will appear twice in the Adjacency structure, once for each terminating end point.

Detailed Description Text (154):
Local ValueSpace, New ValueSpace. Each is an array of records. Each record has 3 fields. The Valuefld contains the metric value vector of the aggregate values to this point in the traversals. The Vptr contains the index within this array of the next metric value vector for the parent family of traversals. The Pathptr contains the index into the PathSpace/NewPathSpace array for the first path of this value vector.

Detailed Description Text (155):
Local PathSpace, New PathSpace. Each is an array of records. Each record has 2 fields. The Pathfld contains the path to this point for the traversals. The Npptr contains the index within this array of the next path for this value vector. A Path is a list of lists. The first list is a sequence of node indices in the order of visits during the traversal. The second list is a sequence of arc indices in the order of visits during the traversal.

Detailed Description Text (158):
Local Best Value is a tuple of metric values. The first is the best primary value of a complete path seen to this point in the processing. The second is the best secondary value seen to this point in the processing.

Detailed Description Text (248):
Several Application Threads exist for SFPS which provide functionality required for SFPS which is not in the SFPS Switch itself. These mainly deal with the access to external servers and control points which exist outside of the embedded device. Each of these threads are instantiated by the SFPS Application Object. Threads are essentially processes or software tasks. Each of the SFPS applications are described below.

Previous Doc Next Doc Go to Doc#

First Hit Fwd Refs Previous Doc Next Doc Go to Doc#

Generate Collection Print

L21: Entry 5 of 46 File: USPT Jul 21, 1998

US-PAT-NO: 5784557
DOCUMENT-IDENTIFIER: US 5784557 A

TITLE: Method and apparatus for transforming an arbitrary topology collection of nodes into an acyclic directed graph

DATE-ISSUED: July 21, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Oprescu; Florin	Sunnyvale	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Apple Computer, Inc.	Cupertino	CA			02

APPL-NO: 08/777909 [PALM]
DATE FILED: December 20, 1996

PARENT-CASE:
This is a continuation of application Ser. No. 08/517,074, filed Aug. 21,1995, now abandoned, which is a continuation of application Ser. No. 07/994,128, filed Dec. 21, 1992, abandoned.

INT-CL-ISSUED: [06] G06 F 13/00

US-CL-ISSUED: 395/200.5; 395/200.82, 370/254, 370/255, 370/256
US-CL-CURRENT: 709/220; 370/254, 370/255, 370/256, 709/252

FIELD-OF-CLASSIFICATION-SEARCH: 395/800, 395/200.01, 395/200.1, 395/800.01, 395/200.3, 395/200.5, 395/200.82, 370/254, 370/255, 370/256
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4344134	August 1982	Barnes	364/DIG.1
4698752	October 1987	Goldstein et al.	364/DIG.1
4706080	November 1987	Sincoskie	340/825.52

☐	4740954	April 1988	Cotton et al.	370/60
☐	4811337	March 1989	Hart	370/85
☐	4881166	November 1989	Thompson et al.	364/DIG.1
☐	5018133	May 1991	Tsukakoshi et al.	370/16
☐	5079767	January 1992	Perlman	370/94.3
☐	5088032	February 1992	Bosack	395/200.01
☐	5138615	August 1992	Lamport et al.	370/94.3
☐	5150360	September 1992	Perlman et al.	370/94.3
☐	5280619	January 1994	Wang	395/725
☐	5309437	May 1994	Perlman et al.	370/85.13
☐	5355371	October 1994	Auerbach et al.	370/60
☐	5491692	February 1996	Gunner et al.	370/85.13

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0118731	September 1984	WO	
9206436	April 1992	WO	

OTHER PUBLICATIONS

Even et al., "How to keep a dynamic distributive directed graph acyclic and yet grant all request of edge additions," JCIT, Oct. 22-25 1990, pp. 414-425.
Jovanovic, "Software Pipelining of Loops by Pipelining Strongly Connected Components," IEEE 1991, pp. 351-365.
Belik, "An Efficient Deadlock Avoidance Technique," IEEE Transactions on Computers, Jul. 1990, pp. 882-888.
Chaudhary, "A Near Optimal Algorithm for Technology Mapping Minimizing Area under Delay Constraints," ACM/IEEE Design Automation Conference, Jun. 1992, pp. 492-498.
Ravindran et al., "Multicast Models and Routing Algorithms for High Speed Multi-service Networks," IEEE 1992, pp. 194-201.
Neilsen et al., "A Dag-Based Algorithm for Distributed Mutual Exclusion," IEEE, May 1991, pp. 354-360.
Toshinori Sueyoshi, "Hierarchical Routing Bus", 1985, vol. 16, pp. 10-19.
Cidon et al, "Dynamic Tree Detection in Computer Network", IEEE, Apr. 1987, pp. 181-187.
Bowie, "Distributed Operating Systems," Abstract, Computer Science Conference, Feb. 20, 1975, p. 24, Washington D.C.
Cidon and Gopal, "Dynamic Tree Detection in Computer Networks," Proceedings of IEEE, Infocom, Apr. 2, 1987, pp. 181-187, San Francisco, USA.
Wu, et al., "Prototype of Star Architecture-A Status Report," AFIPS Conference Proceedings, Jul. 18, 1985, Chicago, U.S., pp. 191-201.
Bokhari and Raza, "Augmenting Computer Networks," Proceedings of the 1984 International Conference on Parallel Processing, Aug. 24, 1984, Ohio, U.S., pp. 338-345.
"IEEE Standards for Low-Voltage Differential Signals (LVDS) for Scalable Coherent Interface (SCI), The Institute of Electrical and Electronics Engineers, Inc., Jul. 31, 1996.
"IEEE Standards for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges", The Institute of Electrical and Electronics Engineers, Inc., Mar.

8, 1991.
"Local Area Network Applications", Bob Stewart and Bill Hawe, Telecommunications., Sep. 1984, vol. 18, No. 9, pp. 4, pp. 96F-96M.

ART-UNIT: 273

PRIMARY-EXAMINER: Bowler; Alyssa H.

ASSISTANT-EXAMINER: Davis, Jr.; Walter D.

ATTY-AGENT-FIRM: Blakely, Sokoloff, Taylor & Zafman

ABSTRACT:

A system and method are described which take an arbitrarily assembled collection of nodes on a bus or network and imposes an optimized hierarchical tree structure where there is only one root node. Nodes having both parent and child nodes are considered branch nodes while nodes having only parent nodes are leaf nodes. Loops or cycles in the physical topology are resolved into a logical topology that is acyclic and directed. A signaling scheme is developed in which nodes, via on board communications hardware, signal all connected nodes and respond accordingly until hierarchical relationships are established. Cycles are resolved by intelligently breaking links to yield an acyclic graph. Direction is established by each node recognizing its parent/child status with respect to connected nodes until a single node is established as a root node.

27 Claims, 20 Drawing figures

Previous Doc Next Doc Go to Doc#

L21: Entry 5 of 46 File: USPT Jul 21, 1998

DOCUMENT-IDENTIFIER: US 5784557 A
TITLE: Method and apparatus for transforming an arbitrary topology collection of nodes into an acyclic directed graph

Detailed Description Text (4):
The bus architecture described herein, though described with reference to components for a single computer, in general has a broader scope. The present invention for defining the bus topology may be applied to any arbitrarily assembled collection of nodes linked together as in a network of devices. One point that must be noted is that it is necessary to distinguish a node from a physical computer component. Each component to reside on the bus will have associated with it at least one node physical layer controller. In certain circumstance, a given component may advantageously be associated with multiple nodes but in the usual case there will be a one-to-one correspondence between devices or components on the bus and nodes.

Detailed Description Text (13):
Initially, the process of transforming an acyclic arbitrary topology graph into a directed graph will be described. The case where cycle resolution is required will follow. FIG. 3(a) shows the arbitrary graph of FIG. 2(a) wherein the nodes and links have status labels and communicated signals are indicated for the graph transformation process for directing a graph. It is instructive at this point to describe signal communications between nodes. FIG. 3(b) illustrates two nodes 50 and 51 (hereinafter node A and node B, respectively) coupled by link 52. As described, the link is the communications channel coupling transceiver ports of the respective nodes as described above with reference to FIG. 1. During the graph transformation process, it becomes necessary for nodes to establish parent-child relationships with adjacent nodes. Two nodes are said to be adjacent nodes if there is at least one link connected between a port of the first node and a port of the second node. In FIGS. 3(b)-3(d) it will be assumed that the relationship to be resolved is that node B is the parent of node A and that it is appropriate for the nodes to establish that relationship.

Detailed Description Text (42):
In the case where there is a dangling "shall be root" node which still has its cycle node attribute, the node will respond as described above with respect to cycle parent messages. At this point there will be no multiple cycles remaining with the broken links taken into account. The above breaking of the multiple cycles for the example shown in FIG. 5(b) will either yield no remaining cycles or one remaining simple cycle, a cycle in which all cycle nodes are single cycle nodes.

Detailed Description Text (68):
As an alternative to the fair and priority bus access arbitrations schemes described above, the present invention may be utilized in implementing a token passing bus arbitration scheme. Metaphorically speaking, token passing bus access refers to the notion that a node may communicate on a bus when it is in possession of a token that is passed between nodes. The token is passed from node to node in a cyclic fashion so that each node receives the bus in a predetermined point in the cycle. Token passing is implemented in the present invention in following the same manner as the physical address assignment routine described above. The

predetermined selection mechanisms implemented are used to select the order in which the token will be passed from node to node. This order resembles the order as shown in FIG. 7 which dictates the order of unique address assignment. Each node, when it is assigned the token will propagate its information packet on the bus while the remaining nodes listen. The node will then pass the token to the next logical node based on the predetermined sequencing method as described above.

Other Reference Publication (5):
Ravindran et al., "Multicast Models and Routing Algorithms for High Speed Multi-service Networks," IEEE 1992, pp. 194-201.

Other Reference Publication (15):
"Local Area Network Applications", Bob Stewart and Bill Hawe, Telecommunications., Sep. 1984, vol. 18, No. 9, pp. 4, pp. 96F-96M.

Previous Doc Next Doc Go to Doc#

First Hit Fwd Refs Previous Doc Next Doc Go to Doc#

Generate Collection Print

L21: Entry 7 of 46 File: USPT May 26, 1998

US-PAT-NO: 5757784
DOCUMENT-IDENTIFIER: US 5757784 A

TITLE: Usage-based billing system for full mesh multimedia satellite network

DATE-ISSUED: May 26, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Liebowitz; Burt	North Bethesda	MD		
Sweeney; Steven	Silver Spring	MD		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Orion Atlantic, L.P.	Rockville	MD			02

APPL-NO: 08/582750 [PALM]
DATE FILED: January 4, 1996

INT-CL-ISSUED: [06] H04 B 7/212, H04 M 15/32

US-CL-ISSUED: 370/321; 370/345, 370/442, 379/112, 379/114
US-CL-CURRENT: 370/321; 370/345, 370/442, 379/114.01, 379/114.06, 379/114.07

FIELD-OF-CLASSIFICATION-SEARCH: 379/112, 379/114, 379/115, 379/117, 379/119, 379/121, 370/321, 370/319, 370/316, 370/315, 370/345, 370/349, 370/432, 370/442, 370/458, 370/459
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4273962	June 1981	Wolfe	179/7.1R
4319353	March 1982	Alvarez, III et al.	370/104
4322845	March 1982	Fennel, Jr. et al.	370/104
4330857	May 1982	Alvarez, III et al.	370/104
4424417	January 1984	Chavey et al.	179/2
4507781	March 1985	Alvarez, III et al.	370/104

☐	4642806	February 1987	Hewitt et al.	370/95
☐	4774707	September 1988	Raychaudhuri	370/95
☐	4870642	September 1989	Nohara et al.	370/75
☐	4888769	December 1989	Deal	370/50
☐	4995096	February 1991	Isoe	455/12
☐	5072445	December 1991	Nawata	370/104.1
☐	5309439	May 1994	Roos	370/104.1
☐	5392450	February 1995	Nossen	455/12.1
☐	5434850	July 1995	Fielding	370/50
☐	5446733	August 1995	Tsuruoka	370/60.1

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0324363	January 1989	EP	
WO 0001012	January 1995	WO	

OTHER PUBLICATIONS

Liebowitz, Burt, "Cost Effectiveness of TDMA Based, Full Meshed VSAT Networks", presented at International Telecommunications Society Conference, Sep. 1, 1995, Nice, France.
Liebowitz, Burt, "Multi Media Meshed Networking Using VISN", presented at York Electronics Center, University of York, England, for course entitled VSAT Systems Technology Applications and Opportunities. Apr., 1995.
Wilmot, Chris, Frame Relay Solution, Feb./Mar. 1996, vol. 1, No. 2., pp. 11-16 (CMI Ltd., London).
Fleming, Stephen, "What Users Can Expect from New Virtual Wideband Devices", Telecommunications, Oct., 1990, vol. 24, No. 10, pp. 29-36.
Gordon, James, "Extending the Lan Range", Telecommunications, Oct., 1990, vol. 24, No. 10, pp. 66-68.
Muller, Nathan J., "The Management Aspects of Frame Relay", International Journal of Network Management, Jun., 1992, pp. 87-89.
Roy, Asim, "Frame Relay and Its Transportation Dilemma", Proceedings from the 1991 Singapore International Conference on Networks (Singapore, 5-6 Sep. 1991)pp. 393-400.
Rana, Abdul Hamid, "VSAT--Enhanced ISDN: Architectures and Implementation", IEEE Journal on Selected Areas in Communications, Aug. 10, 1992, No. 6, pp. 1081-1092.
Platt, A. et al, "Some Aspects of Traffic Management in Frame Relay Networks", CA Conference Article, IEE Eight UK, Teletraffic Symposium, 1991 Beeston, U.K., pp. 23/1-23/6.
Pontano, B.A. et al, "ISDN Over Satellite Networks", Proceedings of the Milcom 1992 Conference on Communications-Fusing Command, Control and Intelligence, San Diego, CA Oct. 11-14, 1992, vol. 2 of the Conferene Record, pp. 561-564.

ART-UNIT: 263

PRIMARY-EXAMINER: Olms; Douglas W.

ASSISTANT-EXAMINER: Phillips; Matthew C.

ATTY-AGENT-FIRM: Roylance,Abrams,Berdo & Goodman, L.L.P.

ABSTRACT:

A satellite communications system is provided for full mesh connectivity between a number of earth terminals via a satellite link. The earth terminals are connected to user access devices to receive and transmit voice, video and data and are operable to generate bursts to transmit user data via a satellite, and to process data received from the satellite and transmit it to the addressed user access devices. The terminals each comprise a programmable computing device which organizes bursts in at least one of a plurality of slots constituting a time division multiple access frame in accordance with a burst plan. Billing is based on usage and committed information rates. Data and voice can be billed on one invoice.

22 Claims, 13 Drawing figures

Previous Doc Next Doc Go to Doc#

L21: Entry 7 of 46 File: USPT May 26, 1998

DOCUMENT-IDENTIFIER: US 5757784 A
TITLE: Usage-based billing system for full mesh multimedia satellite network

Abstract Text (1):
A satellite communications system is provided for full mesh connectivity between a number of earth terminals via a satellite link. The earth terminals are connected to user access devices to receive and transmit voice, video and data and are operable to generate bursts to transmit user data via a satellite, and to process data received from the satellite and transmit it to the addressed user access devices. The terminals each comprise a programmable computing device which organizes bursts in at least one of a plurality of slots constituting a time division multiple access frame in accordance with a burst plan. Billing is based on usage and committed information rates. Data and voice can be billed on one invoice.

Brief Summary Text (9):
The system of the present invention can provide hub-less, full mesh connectivity, both fixed and dynamic bandwidth allocation, voice, video and data integration, support for frame relay and voice, support for protocols such as SNA, TCP/IP, and binary synchronous (BSC), and broadcast and multicast transmission capability, while being relatively less expensive than other fully meshed satellite communication systems.

Drawing Description Text (12):
FIGS. 10, 11 and 12 illustrate exemplary portions of an invoice generated by the billing system depicted in FIG. 9 in accordance with an embodiment of the present invention.

Detailed Description Text (52):
Bandwidth sharing also occurs among terminals 12 since a common pool of network bandwidth potentially available for use by every terminal 12 is maintained by the terminal designated to be the burst plan manager terminal. A terminal 12 uses virtual circuits of differing data rates and quality of service to support voice, including analog facsimile, video and data applications. A terminal provides the capability to assign a fixed and guaranteed bandwidth (i.e., a CIR) to a PVC, port 40 or a terminal 12. The PVC CIR is analogous to the CIR service offered by terrestrial providers. It defines bandwidth available on a point-to-point connection defined by the PVC. The only limit to achieving throughput equal to the CIR is the capability of the receiving user application to support the data rate.

Detailed Description Text (53):
Port and terminal CIRs are distinguished from a conventional PVC CIR in that they define point-to-multipoint throughput. The port CIR is a guaranteed bandwidth from the port 40 of a terminal 12 to any set of compatible ports 40 in the system 10. A terminal CIR is a guaranteed bandwidth from a terminal 12 to any set of terminals 12 in the system 10. As with the PVC CIR, the collective recipients of the data need to be capable of receiving data at the transmitted rates. CIRs are typically available between 16 Kbps and 512 Kbps. A terminal CIR is offered at two levels of quality of service. A standard terminal CIR guarantees that bandwidth is available when needed, but is released when not needed. The released bandwidth is available

for use by other terminals 12. The enhanced CIR (ECIR) guarantees bandwidth to always be available whether the user needs it or not. The ECIR service is useful for applications in which no delay or delay variation can be tolerated.

Detailed Description Text (56):
In accordance with yet another aspect of the present invention, a billing procedure is used to bill users for voice or video based on the number of minutes on a PVC, for data based on the number of bytes actually sent over the subscribed information rate, as well as for the basic fee for the subscribed rate. Further, the system 10 provides users with a number of different services including a CIR, an ECIR, an excess information rate (EIR), an available bit rate (ABR), also known as a Zero CIR, a scheduled CIR, and a scheduled ECIR, although other services can be offered.

Detailed Description Text (62):
An on-line access terminal 200 is preferably provided to configure customer accounts and update rate tables. CDRs are preferably provided to the billing system 190 either in real time or as CDR files at the end of a billing cycle by the NMC 13. The billing program is used to generate customer invoices 202, billing statements and reports 204 for the network provider. The billing information is stored in a database 206 for on-line access by the provider and can be used to generate account receivable records 208 which can be stored on magnetic media, for example, for use by the network provider. The NMC 13 is preferably provided with a graphic user interface (GUI) 210 or equivalent console which is programmed to employ a graphical user interface based on, for example, X Window software to create a series of windows and screens for guiding an operator through network management and control operations. In addition to billing and accounts review processes, an operator can use the GUI 210 to obtain performance measurements and statistics for voice and data along virtual circuits to generate standard and customized reports, to alter network parameters and to partition the network as needed. The GUI can generate screens displaying a map of all terminals 12 in the system 10, status and configuration of the entire system, as well as status of each terminal port 40 in the system 10. Once the system 10 is defined, information is stored in configuration database files.

Detailed Description Text (63):
Regarding the billing system 190, the customer database 192 is a repository for maintaining customer account information including general account information, such as customer name, address, customer contact and other information regarding preferred language and currency, customer network configuration information and subscription information. A customer network generally comprises two or more terminals 12, and each terminal 12 therein is configured with several user access ports 40 (e.g., voice, video, frame relay, asynchronous/synchronous data and Ethernet). A user access port 40 is preferably uniquely identified by a network user identifier (NUI) . The NUI can be an end point of a PVC identified by a terminal identification number, a port identification number and, for example, a data link connection identifier (DLCI), an Ethernet port identified by the terminal and port identification numbers, or a voice or data port identified by terminal, port and multiplexer port identification numbers. Subscription information generally includes services subscribed for by the customer, such as CIR on a PVC, EIR on a PVC, data by bytes on Ethernet, PVC or auxiliary data ports, voice by minutes across a port or terminal or PVC, among other services described above.

Detailed Description Text (64):
The rate tables 194 comprise flat rates, usage rates for voice, data and video services, promotional rates and customized rate tables according to countries or customer accounts. Flat rates can include, for example, access fees for a terminal or port, installation fees, maintenance fees, administration fees, or other services for which a flat rate is charged. Rates for voice calls are preferably specified in minutes on a bill. Two sets of rates for voice calls are provided

based on the quality of calls such as calls using 8 or 16 Kbps circuits. The rates also vary, depending on whether voice calls are prime or non-prime time calls. Data services are billed by CIR and EIR. Rate tables for CIR services support multiple data rates between 0 Kbps to T1 rates. The EIR rates are based on the CIR as a base price, and then vary according to the block of kilo-characters (Kchar) transmitted provided bandwidth was available. For example, EIR rates for a 9.2 Kbps CIR differ from that of a T1 CIR for the same amount of access bandwidth used. The access bandwidth is billed based on blocks of kilo-characters. The EIR rates also take into account the time of day (i.e., prime and non-prime hours). Video services are specified on a bill in terms of minutes and factor in time of day. Customized rate tables can be created by operators to accommodate operating costs in different countries or to extend advantages to preferred customers. Customized rate tables reflecting promotional rates can also be used in lieu of default rate tables.

Detailed Description Text (66):
The billing system 190 uses the customer database 192, the rate tables 194 and the CDR files 196 to generate customer invoices 202. Customer invoices prepared by the network provider or a separate billing services provider preferably comprise a fixed portion and an usage portion. The fixed portion includes recurring access fees based on the number of customer sites and carrier rate, an installation fee, a maintenance fee and any other optional service fee of the provider. The usage portion 212 lists detailed call information for each of the user access ports. For frame relay PVCs, the usage portion of an invoice contains the NUI, source and destination end point identification (e.g., site number, interface port and DLCI), the subscribed CIR service, the CIR price calculated according to the CIR rate tables and EIR details such as date, prime and non-prime hour kilo-characters sent, as well as prime and non-prime hour prices and the total price.

Detailed Description Text (67):
An example of a frame relay portion of an invoice is depicted in FIG. 10. An Ethernet portion on an invoice is shown in FIG. 11. The usage portion 214 of an invoice for an Ethernet port is similar to that of a frame relay PVC. The Ethernet port is identified by its NUI, and terminal and port identification numbers. As shown in FIG. 12, the usage portion 216 of an invoice for voice channel identifies the voice channel using an identification number for a multiplexer port, as well as for the NUI end terminal 12 and terminal port 40. The invoice contains information such as date and time of call, destination NUI, terminal and multiplexer port identification numbers, duration of a call in minutes or seconds, whether the call is a prime or non-prime call and the price. Using general account information, the billing system 190 can generate invoices in different currencies and support currency conversion as well as generate invoices in various languages.

Detailed Description Text (68):
The on-line access terminal 200 of FIG. 10 can be used for service order processing such as viewing and modifying customer account information, customer network configuration and customer subscription information. An operator can use the on-line access terminal 200 to view and modify rate tables, create new rate tables by country and by customer accounts, establish new promotional rate tables as well as specify effective dates for rate tables. In addition to reviewing customer bills to verify customer accounts and respond to billing related queries for customers, an operator can use the on-line access terminal 200 to apply credits or debits to customer accounts due to rate changes, billing errors or special discounts.

Detailed Description Text (72):
The system 10 can support networks of 256 nodes, for example, and more. An SCPC system is limited in a practical sense to 5 to 10 nodes. Each SCPC node must support a demodulator for each other node in the network. In a large network, the number of demodulators at each SCPC node increases cost, physical space requirement, and power requirements to the point where the system is impractical to implement. Also, as the number of carriers increases, the SCPC system space segment

cost increases relative to that of the disclosed system. This is because each SCPC node must be sized to its peak bandwidth requirements. There is no statistical multiplexing between SCPC nodes. In contrast, the more terminals 12 used in the system 10, the greater the satellite bandwidth efficiency, since the TDMA/DAMA allocation scheme supports statistical multiplexing between nodes.

CLAIMS:

3. For use in a satellite communications system providing fully meshed connectivity between a number of earth terminals via a satellite link, the earth terminals being connected to user access devices to receive and transmit at least one of voice, video and other data, an earth terminal comprising:

a processor having a digital memory device and a plurality of ports for connecting to said user access devices, said processor being operable to generate bursts using data received from said user access devices for transmission via said satellite, and to process data received via said satellite and addressed to one of said user access devices for transmission to said user access device;

a modem connected to said processor for modulating said bursts onto radio frequency modulated signals and demodulating downlink carrier signals received from said satellite;

a radio frequency transceiver connected to said modem for converting said modulated signals to an uplink carrier signal for broadcast to each of said earth terminals via said satellite, and for converting said downlink carrier signals to corresponding modulated signals, respectively;

wherein said processor is programmable to receive data from said user access devices of a data type selected from the group consisting of voice, video and other data, to arrange said received data into at least one of said bursts, to transmit said bursts in at least one of a plurality of slots constituting a time division multiple access frame transmitted over said satellite link, and to provide at least one device selected from the group consisting of said terminal and one of said plurality of ports with a service for transmitting said bursts, said service selected from the group consisting of a committed information rate representing an amount of bandwidth on said satellite link guaranteed to said device at all times, an excess information rate representing the committed information rate and additional bandwidth in excess thereof when available in said frame, a guaranteed information rate representing the committed information rate and additional available bandwidth subject to delay, an available bit rate representing bandwidth when available with no guaranteed bandwidth, a scheduled committed information rate representing a guaranteed amount of bandwidth at a particular time of day but not at other times, and a scheduled guaranteed information rate;

and further comprising a processing device configured to communicate with each of said terminals for generating an invoice for said device having said committed information rate, said invoice charging a monetary amount corresponding to the data rate of said device.

4. For use in a satellite communications system providing fully meshed connectivity between a number of earth terminals via a satellite link, the earth terminals being connected to user access devices to receive and transmit at least one of voice, video and other data, an earth terminal comprising:

a processor having a digital memory device and a plurality of ports for connecting to said user access devices, said processor being operable to generate bursts using data received from said user access devices for transmission via said satellite, and to process data received via said satellite and addressed to one of said user access devices for transmission to said user access device;

a modem connected to said processor for modulating said bursts onto radio frequency modulated signals and demodulating downlink carrier signals received from said satellite; and

a radio frequency transceiver connected to said modem for converting said modulated signals to an uplink carrier signal for broadcast to each of said earth terminals via said satellite, and for converting said downlink carrier signals to corresponding modulated signals, respectively;

wherein said processor is programmable to receive data from said user access devices of a data type selected from the group consisting of voice, video and other data, to arrange said received data into at least one of said bursts, to transmit said bursts in at least one of a plurality of slots constituting a time division multiple access frame transmitted over said satellite link, and to provide at least one device selected from the group consisting of said terminal, and one of said plurality of ports with a service for transmitting said bursts, said service selected from the group consisting of a committed information rate representing an amount of bandwidth on said satellite link guaranteed to said device at all times, an excess information rate representing the committed information rate and additional bandwidth in excess thereof when available in said frame, a guaranteed information rate representing the committed information rate and additional available bandwidth subject to delay, an available bit rate representing bandwidth when available with no guaranteed bandwidth, a scheduled committed information rate representing a guaranteed amount of bandwidth at a particular time of day but not at other times, and a scheduled guaranteed information rate representing said guaranteed information rate;

and further comprising a processing device for generating invoices for said device having one of said excess information rate and said guaranteed information rate, said invoices charging a monetary amount corresponding to the data rate of said device and a monetary amount based on the number of additional bytes transmitted in bursts using said additional bandwidth.

5. For use in a satellite communications system providing fully meshed connectivity between a number of earth terminals via a satellite link, the earth terminals being connected to user access devices to receive and transmit at least one of voice, video and other data, an earth terminal comprising:

a processor having a digital memory device and a plurality of ports for connecting to said user access devices, said processor being operable to generate bursts using data received from said user access devices for transmission via said satellite, and to process data received via said satellite and addressed to one of said user access devices for transmission to said user access device;

a modem connected to said processor for modulating said bursts onto radio frequency modulated signals and demodulating downlink carrier signals received from said satellite;

a radio frequency transceiver connected to said modem for converting said modulated signals to an uplink carrier signal for broadcast to each of said earth terminals via said satellite, and for converting said downlink carrier signals to corresponding modulated signals, respectively;

wherein said processor is programmable to receive data from said user access devices of a data type selected from the group consisting of voice, video and other data, to arrange said received data into at least one of said bursts, to transmit said bursts in at least one of a plurality of slots constituting a time division multiple access frame transmitted over said satellite link, and to provide at least one device selected from the group consisting of said terminal, and one of said

plurality of ports with a service for transmitting said bursts, said service selected from the group consisting of a committed information rate representing an amount of bandwidth on said satellite link guaranteed to said device at all times, an excess information rate representing the committed information rate and additional bandwidth in excess thereof when available in said frame, a guaranteed information rate representing the committed information rate and additional available bandwidth subject to delay, an available bit rate representing bandwidth when available with no guaranteed bandwidth, a scheduled committed information rate representing a guaranteed amount of bandwidth at a particular time of day but not at other times, and a scheduled guaranteed information rate representing said guaranteed information rate;

and further comprising a processing device for generating invoices for said device having said available bit rate, said invoices charging a monetary amount based on the number of bytes transmitted in said bursts.

6. A method of billing users for accessing a satellite link in a satellite communications network via terminals to originate at least one of a voice call, a video call, and transmission of data bytes, each virtual circuit in the network having a corresponding data link connection identifier, the method comprising the steps of:

storing a subscriber information rate for each of said users in a memory device;

assigning each of said terminals a terminal identification code;

assigning each port on said terminals a port identification code;

generating network usage data at each of said terminals for each of said ports corresponding thereto, said network usage data selected from the group consisting of a source network user identifier for a source port selected from said ports and used by said user to access said network, said source network user identifier comprising at least one of said terminal identification code, said port identification code, and said data link connection identifier corresponding to said source port, the time of day when said user accessed said network, the date when said user accessed said network, the duration of each said voice call, the duration of each said video call, a basic fee for said subscriber information rate, the number of said data bytes sent, the number of said data bytes sent which exceeds said subscriber information rate, and a destination network user identifier for a destination port selected from said ports, said destination network user identifier comprising at least one of said terminal identification code, said port identification code, and said data link connection identifier corresponding to said destination port;

collecting said network usage data from said terminals; and

generating an invoice using said network usage data to bill at least one of said users for accessing said network.

7. A method as claimed in claim 6, wherein said invoice comprises a fixed data portion with recurring access data selected from the group consisting of the number of said terminals associated with said user, said subscriber information rate, an installation fee, a maintenance fee and a service fee, and a usage data portion comprising said network usage data for at least one of said ports corresponding to said user.

8. A method as claimed in claim 6, comprising the step of defining selected times of day as prime time and other selected times of day as non-prime time, wherein said source port is a frame relay port, and wherein said invoice comprises data selected from the group consisting of said number of said data bytes sent during

said prime time, a price for prime time data transmission, said number of said data bytes sent during non-prime time, a price for non-prime time data transmission, total cost and a date when said source port was accessed by said user.

9. A method as claimed in claim 8, wherein said user can select an enhanced rate for transmitting said data bytes at a greater rate than said subscriber information rate when additional bandwidth on said network is available to support said enhanced rate, and said generating step comprises the step of billing transmission of said data bytes on said invoice based on said basic fee and said number of bytes sent that exceeds said subscriber information rate.

10. A method as claimed in claim 8, wherein said invoice comprises a fixed data portion comprising data selected from the group consisting of said terminal identification code, said port identification code and said data link connection identifier for said source port and said destination port, said subscriber information rate, and said basic fee.

11. A method as claimed in claim 6, comprising the step of defining selected times of day as prime time and other selected times of day as non-prime time, wherein said source port is an Ethernet port, and wherein said invoice comprises data selected from the group consisting of said number of said data bytes sent during said prime time, a price for prime time data transmission, said number of said data bytes sent during non-prime time, a price for non-prime time data transmission, total cost and a date when said source port was accessed by said user.

12. A method as claimed in claim 11, wherein said user can select an enhanced rate for transmitting said data bytes at a greater rate than said subscriber information rate when additional bandwidth on said network is available to support said enhanced rate, and said generating step comprises the step of billing transmission of said data bytes on said invoice based on said basic fee and said number of bytes sent that exceeds said subscriber information rate.

13. A method as claimed in claim 11, wherein said invoice comprises a fixed data portion comprising data selected from the group consisting of said terminal identification code, and said port identification code for said source port, said subscriber information rate, and said basic fee.

14. A method as claimed in claim 6, wherein at least two of said ports are connected to at least one multiplexer for handling said voice call occurring between said two ports, and further comprising the step of assigning a multiplexer identification code to said multiplexer, said invoice comprising data selected from the group consisting of said terminal identification code, said port identification code and said multiplexer identification code of said destination port, said time of day when said user originated said voice call, said date of said voice call, said duration of said voice call, a rate for pricing said voice call and total cost.

16. A method as claimed in claim 6, wherein said ports associated with said user comprise a frame relay port and a voice port, said generating step comprising the step of generating a single invoice comprising billing data relating to said voice call and the number of said data bytes sent over said satellite link.

18. A method as claimed in claim 6, wherein said subscriber information rate comprises point-to-point rates for each of said virtual circuits associated with said user, and point-to-multipoint rates for said ports and said terminals associated with said user.

19. A method as claimed in claim 6, wherein said generating step comprises the step of determining a billing amount for said video call originated by said user on said invoice based on said basic fee.

Previous Doc Next Doc Go to Doc#